

# Multicriteria Air Traffic Flow Management

Kenneth D. Kuhn  
University of Canterbury  
Private Bag 4800  
Christchurch, New Zealand  
kenneth.kuhn@canterbury.ac.nz

Air traffic flow management initiatives, such as *ground delay programs* and *airspace flow programs*, mitigate and avoid situations where demand for air transportation system resources outstrips supply. Mathematical programming formulations of air traffic flow management problems typically minimize delay costs. In practice, equity is a critical concern. According to *ration by schedule*, flights are granted access to capacity constrained airports in a way that preserves the order of initial schedules. In addition, environmental impacts of management decisions are receiving increasing attention. This presentation will describe the setup and solution of multicriteria air traffic flow management problems. The introduced approach enables discovery of all solutions efficient / Pareto-optimal in terms of efficiency, equity, and environmental impacts without having to select and parameterize models relating fundamentally incompatible air traffic control objectives. Simulation studies show that the computational burdens associated with solving multicriteria air traffic flow management problems are larger than those associated with single-objective problems, but not necessarily large enough to prohibit their incorporation into decision support tools for air traffic controllers. In particular, it may make sense to use a *two-phase approach*. The first phase would involve finding *supported efficient solutions* on the boundary of the convex hull of the feasible region. The second phase finds other efficient solutions. An algorithm based on the two-phase approach would yield the same information as an algorithm solving a single-objective problem in the same time and further information / Pareto-optimal schedules as time allows.